Improving resource utilization in the intensive care units

A challenge for Saudi Hospitals

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ABSTRACT

In the face of increasing demand of intensive care services in the Kingdom of Saudi Arabia, as well as the high cost of delivering such services, systematic steps must be undertaken in order to ensure optional utilization and fair allocation of resources. Strategies start prior to intensive care units (ICU) admission by the proper selection of patients who are likely to benefit from ICU. Less resource-demanding alternatives, such as intermediate care units, should be used for low-risk patients. Do-not-resuscitate status in patients with no meaningful chance of recovery will prevent futile admissions to ICUs. Measures known to improve the efficiency of care in the ICU must be implemented, including hiring full-time qualified intensivists, switching open units to closed ones and the introduction of certain evidence-base driven management protocols. On discharge, the intermediate care units again play a role as less expensive alternative transitional area for patients who are not stable enough to go to general ward. Measures to reduce re-admissions to ICU must also be implemented. Improving ICU resource utilization requires teamwork not only the intensivists but also the administrators and other health care providers.

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Critical care has come a long way from its beginning in the 1950's with a simple hand ventilation and 'iron lung' ventilators.[1] Then came positive pressure ventilation and effective ventilators were developed. This along with improved circulatory support radically extended its frontiers. The ability to take over the role of a failing organ until recovery occurs has made increasingly complex interventions feasible. An intensive care unit (ICU) has been defined as 'a hospital area in which an increased concentration of specially trained staff and monitoring equipment allow more detailed and frequent monitoring and more frequent intervention in seriously ill patients.[1] Its mission is to: (i) preserve meaningful human life when threatened by an acute illness or injury; (ii) provide specialized rehabilitative care to patients as they begin to recover; and (iii) provide compassionate care to the dying and to their families to ensure that suffering is alleviated. There is a worldwide increase in the demand for critical care services.[2] This is related to the aging of the population, the extended survival of previously incurable diseases, the increase in immunocompromised patients and the availability of new therapies or surgeries that typically require intensive care. The improvement in the field of critical care medicine itself has made it possible to improve or prolong survival of certain diseases leading to longer ICU stay and more resource utilization. In addition to the above-mentioned, there are certain

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unique factors in the Kingdom of Saudi Arabia (KSA) that make the demand for intensive care services an even more pressing issue. The rapidly flourishing health care in KSA and the return of highly qualified physicians and surgeons after completion of their postgraduate training in an international academic medical centers lead to the introduction of highly advanced and sophisticated therapies. Such therapies or surgeries typically require intensive care, such as the case with bone marrow, liver transplantation and radical cancer surgeries. Many patients who required such treatment in the past had to go abroad, while it become possible now to provide such treatments locally. Another important factor in adding to demands on intensive care is the fact that KSA hosts annually the Hajj (Islamic Pilgrim).[3] Nearly 2 million pilgrims from all over the world assemble every year in Makkah, KSA for performing the Hajj. A significant proportion of these patients are elderly and mostly have chronic illnesses, and therefore, more likely to need health care, including intensive care. A 3rd factor is the unfortunately increasing incidence of road traffic accidents.[4] This adds an enormous load for medical care facilities, especially for intensive care.

The intensive care is an expensive care. The ICUs consume a significant proportion of the hospital resources. The United States of America (USA) spends approximately 1% of the Gross National Product for intensive care services; patients receiving medical care in ICUs account for nearly 30% of acute care hospital costs.[2] In the United Kingdom (UK), a study of 21 ICUs estimated a median cost per ICU patient day of £904 (£828 to 1,163), equivalent to 5,085 Saudi Riyals (SR) (range SR4,676-6,544).[5] The number of acute hospital beds allocated to general and specialist intensive care varies among countries - UK had 2.6% while Denmark had a higher proportion of 4.1%.[6] A survey in 1991 by the American Hospital Association estimated that intensive care or coronary care beds accounted for 8.1% of all beds in hospitals in the USA.[7] This contrasted with the low percentage (1%) in Japan.[8] While the number of intensive care beds in relation to total acute hospital beds is small, the provision of intensive care is relatively expensive. The current provision of intensive care in KSA is characterized by considerable variation in organization and delivery, quality, funding and effectiveness. While the demands and expenditure on intensive care have risen probably faster than most other specialties, no information as to the cost of care in the ICUs exists at the national level. The estimated cost of the King Fahad National Guard Hospital (KFNGH), Riyadh, KSA based on costing by the Business Center for private patients, for one day in the ICU varies from SR4,000-8,000 (personal communication). It is our duty as healthcare providers to meet the challenge of reducing the ICU costs without changing the quality of care.

The "bottleneck" phenomenon. The unavailability of ICU beds can affect the dynamics of the whole hospital **(Figure 1)**. It causes cancellation of elective surgeries leading to wasted operative time, underutilization of the surgeons, anesthetists and nursing and other operating room personnel. There is a longer waiting list on the surgical wards, prolonging the hospital stay of patients awaiting surgery and exposing them to nosocomial complications. The unavailability of ICU beds also affects medical admissions. Patients with early life-threatening problems, who are likely to benefit from care in the ICU, have to be managed on the medical wards. When admitted at a later stage, these patients are less likely to benefit from the intensive care. Even admissions from the Emergency Department have to be held in the Emergency Department itself, adversely affecting outcome and resources. The changing healthcare environment mandates the efficient utilization of expensive resources. Any improper utilization of ICU beds would result in an avoidable drain on the hospital resources.

Before admission to the intensive care unit. Due to the expensive resources, admissions to the ICU should be reserved for those patients who are likely benefit for intensive care.[9] For some conditions, the benefit from care in the ICU may be no better than that in the conventional ward.[9] These include patients in the 2 extremes of severity of illness: those with low severity of illness and those with very high severity of illness.[9] The first group includes patients who are "too well to benefit" from the ICU care, such as low-risk post-operative patients. For this group, alternatives to ICU admissions could be made available, such as an intermediate care unit (IMCU) or an extended recovery area.[10,11] This would lead to a substantial saving of resources since the day of hospitalization in the IMCU costs just a 3rd of that in an ICU.[11] Such patients typically require a much lower nurse: patient ratio and less intensive technologic monitoring.[11] These patients rarely require active treatment. Implementing protocols to select out patients who can be admitted to the IMCU will decrease the number of low-risk ICU admissions and improve the cost-effectiveness of ICU management.[10]

It is the 2nd group of patients, those "too ill to benefit" from the ICU care, who pose a more difficult challenge. With improvement in medical care, more patients with severe chronic illnesses survive to older ages. If such patients develop critical illness and are admitted to the ICU, they generally have a prolonged stay and consume significant amount of ICU resources with eventually poor outcome. Several critical care professional statements recommend that patients "with very poor prognosis and little likelihood of benefit" should not be admitted to the ICU.[9,12,13] This can be accomplished only by recognizing which patients should have do-not-resuscitate (DNR) orders. Currently, there are several challenges facing the proper application of this important concept: a) The issue of DNR status is not clearly recognized or understood by many physicians in KSA. b) Many hospitals (if not most) in KSA do not have policies regarding DNR and thus do not recognize such status. c) There is confusion in the mind of many

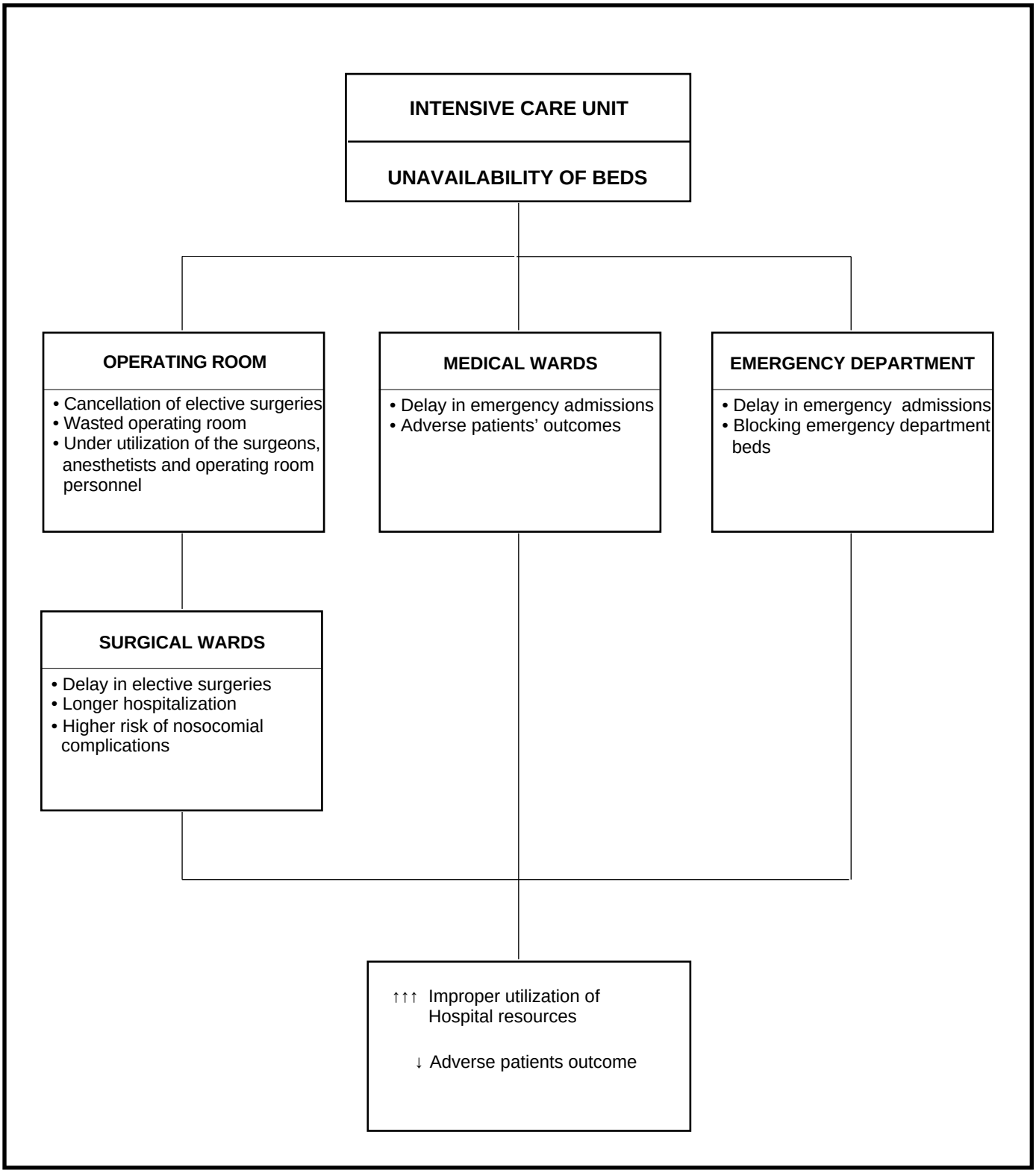

Figure 1 - The consequences of unavailability of beds in the intensive care unit.

doctors about the Islamic position from this issue. d) In hospitals, where a policy for DNR exists, some physicians still reject this concept due to the mistaken notion that DNR status implies foregoing all types of therapy. e) Some physicians believe that DNR not only implies on administering cardiopulmonary resuscitation in case of cardiac arrest; they consider that such status is acceptable only after the patient is admitted in the ICU and all available aggressive medical therapies are exhausted. Such perception leads not only to improper referrals to the ICU but also to massive utilization of ICU resources for these patients with a very high levels of illness, who may require not only mechanical ventilation and vasopressors, but also a long list of therapeutic and diagnostic interventions including continuous veno-venous hemodialysis, pulmonary artery catheters for invasive monitoring, many expensive medications, multiple radiographic, and endoscopic examinations that will end up on dying eventually of life support systems. Writing a DNR order at this late stage does not save any resources and becomes inconsequential. f) There are no administrative regulations addressing the issue of abusing hospital resources. This makes it easy to push therapy to the extreme in patients with no meaningful chance of recovery without recognizing that such action deprives other patients who are likely to benefit from such treatment. g) Communication between the physicians and critically ill patients is often inadequate and proper discussions on end-of-life issues are frequently lacking. A recent study from 6 major Saudi hospitals found that less than half of the physicians provided information all the time to patients or their families regarding serious life-threatening illnesses.[14] The authors offered several possible explanations, including emotional pressures, the lengthy time required for such discussions or concerns that such news might upset the patients. Linguistic differences also might have contributed to the inadequate communication. It is obvious, from our daily practice, that many physicians avoid engagement in discussions about "bad news". While it is natural to prefer delivering "good news", the real test for the communication skills is the ability to deliver unfavorable news in a convincing and comfortable manner. Communication in an honest, clear, transparent and compassionate fashion will make the physician trustworthy in the eyes of the patient and his family. His decisions on end-of-life issues (and others) will be easily accepted. Such interactions have major benefits to the patient, the doctor and the health care system.

Withholding aggressive therapy at the end of life has now been widely accepted in many countries around the world on medical, legal, ethical, and moral grounds.[15] The Islamic religion's concepts concerning DNR decision have been clarified by the Residency of the Administration of Islamic Research and Ifta, Riyadh, KSA, in their Fatwa No. 12086 issued on 30.6.1409 (Hijra). The Fatwa states clearly (in Arabic) that if 3 knowledgeable and trustworthy physicians agreed that the patient condition is hopeless, the life-supporting machines can be withheld or withdrawn. The family members' opinion is not considered as they are unqualified to make such decisions. Based on the above Fatwa, the KFNGH has implemented a "No Code" policy in 1998. The policy states that "No Code" status is applied after agreement of 3 physicians, 2 of whom at least are consultants. The family members will be informed about the decision. In case of conflict with the family, arrangements to transfer care to another facility may be made. The policy had led to a dramatic reduction in futile Cardio-pulmonary resuscitations. In fact, DNR orders are written now for 66% of patients who die in ICU and 82% of patients who die in the wards.[16] However, there is still a great variability in DNR practices. For example, DNR orders are more likely to be written on day one of hospitalization in cancer patients and on the last hospital day in cirrhotic patients, underscoring the delays in recognizing the futility of the treatment in some patients.[16] A decision on DNR, particularly early in the hospital stay, can bring about significant resource use reduction for an identifiable group of patients.[17] Identifying these patients early and carefully evaluating them based on objective and well-validated criteria would allow the establishment of therapeutic limits reducing unnecessary patient suffering and medical care costs. Cardio-pulmonary resuscitation should only be performed on patients, who are likely to derive benefit from it. Similarly, admission to ICU should be offered only to patients who are likely to benefit from the admission.[18] Avoidance of unnecessary admissions to ICU can lead to substantial saving of resources as one day stay on the ward costs only a 6th of that in the ICU.[11] Approaches to address this sensitive matter may include the following: (i) Raising the awareness among people, particularly physicians, on the limitations of aggressive life support. As it is important for the physician to recognize when to provide a therapy, it is of the same importance to recognize when to withhold therapy. Admission to the ICU and the provision of aggressive life support, including cardio-pulmonary resuscitation, should be reviewed as a treatment. Patients may or may not be candidates for this treatment. While failure to provide a proper therapy is considered negligence, improper utilization of the ICU should be considered an abuse of this important resource. Needless to say that not all patients have to be admitted in the ICU for dying; the ICU is not "dying place" but rather an area where life support is provided to patients with reasonable chance of recovery. Raising the public and physicians' awareness can be accomplished by utilizing the media as well as the medical and health education programs, and organizing seminars on the end of life issues. More emphasis has to be placed on end-of-life issues in the curriculum of medical students and the residents.[19] (ii) The practical application of DNR policy is unlikely to succeed without administrative support and enforcement. This can be achieved by having written DNR policies. Also,

there should be a feedback mechanism in which the failure to write a DNR order when indicated should be flagged as quality care indicator for the concerned physician.

In the intensive care unit. There are several ICU-related factors that affect the efficiency of care and the utilization of resources. Among these factors are the medical staffing, the organization of the service (open vs. closed ICU), the presence of a 24-hour on-site intensivist and the use of evidence-base driven protocols.

There is a long list of articles suggesting that having a dedicated trained intensive care physician in the ICU is associated with lower resource utilization and improved outcomes. A study by Hanson et al[20] compared outcomes of 2 groups of patients admitted to a surgical ICU. An intensivist-lead team cared for the first group while the other group was cared for by a team with patient responsibilities in multiple places and supervised by a surgeon. Patients in the intensivist group had shorter ICU stay, used fewer resources and had lower hospital charges. The differences were more pronounced in the patients with high severity of illness. Another study[21] showed that daily rounds by intensivists were associated with a 3 folds reduction of hospital mortality in patients with abdominal aortic surgery. Other studies also support the same notation: better outcome with less resource utilization when the ICU is run by an intensivist.[22-25] Not supervising, therefore, to see that job of intensivist is ranked among the 21 hottest jobs for the 21st century by United States News and World Reports.[26] The ICUs generally follow one of 2 different patterns of clinical management: 'closed' (in which a consultant intensivist has complete responsibility for a patient) or 'open' units (in which responsibility remains with the patient's admitting consultant). The closed unit pattern helps improve quality of care and earlier discharge from ICU. There is mounting evidence-supporting improvement in mortality, morbidity and resource utilization on converting the ICU from an open-unit type to a closed one.[27-30] Evidence supporting the presence of a 24-hour on-site intensivist is emerging. Jacobs et al[31] reported their experience of having an on-site intensivist in a cardio thoracic unit in a tertiary care teaching hospital in New York, USA. In 1991, the surgeon-specific mortality rate of coronary artery bypass graft (CABG) become public. In 1990, the risk-adjusted mortality was 6.2%. This lead to a substantial drops in the number of CABG procedures. This drop lead to hiring of a medical intensivist director and 5 full-time intensivists providing a 24-hour onsite service. After these changes, the risk-adjusted mortality for CABG declined from 6.2 to 1.6%. The ICU length of stay dropped from an average of 7 days in 1992 to 4 days in 1997 and the number of adult open-heart surgeries double from 548 in 1989 to 1133 in 1997. Several other authors also recommended such on-site intensivist coverage on a 24-hour 7-days a week basis.[26,32] While such service might not be affordable by all hospitals, it is expected to see such as service more frequently in tertiary care centers where large number of patients with high severity of illness is admitted to the ICU. Our hospital was a pioneer in this aspect. A 24-hour on-site intensivist service was instituted in 1995.

Implementation of protocols in general has been shown to help in standardizing the care and minimizing the errors. Certain protocols in the ICU have been associated with improvement in outcome and resource utilization; among the best examples are the protocols for mechanical ventilation and sedation. Mechanical ventilation is one of the most common medical therapies administered in the ICUs. The practice of weaning patients from mechanical ventilation varies frequently, even within the same ICU. Upon using protocol-guided weaning of mechanical ventilation in the ICUs, patient outcomes have shown significant improvement with shorter duration of mechanical ventilation and ICU length of stay, lower incidence of ventilator-associated pneumonia, and fewer patient complications; there is also a concomitant reduction in the hospital costs.[33-35] In cardiac surgery cases, early extubation improves resource utilization with reduced cost and length of ICU stay with no increase in the rate or costs of complication.[36] Similarly, protocols aimed at streamlining the administration of sedatives have shown positive impact on patient outcome and resource utilization. Protocols based on daily interruption of sedative-drug infusions help decrease the duration of mechanical ventilation and the ICU length of stay.[37]

At the discharge level. An IMCU can be developed to function as a step-down unit where patients after their initial intense phase of care can be moved for subsequent care. A wide range of conditions and varying severity of illnesses are managed in the IMCUs. For instance, trauma patients tend to stay longer in ICUs; their outcome is encouraging with good survival and functional outcome.[38,39] However, beyond a certain point, they do not require ICU care and can be cared in IMCU, which decreases the demand on resources including nursing. A day of hospitalization in an IMCU would cost only a 3rd of that in the ICU.[11] Readmission to ICU represents another serious challenge to ICU management and resource utilization. A recent review[40] found ICU readmissions rate to average 7% (range 4-10%). The hospital mortality was 2-10 times higher for re-admitted patients compared to control. Intensive care unit and hospital length of stay were significantly longer for re-admitted patients compared to those discharged from ICU and not re-admitted. While re-admissions are related in part to inherent factors associated with the patients' condition, they also can be related to medical care in the ICU and on the ward. Several studies attempted to identify predictors for re-admissions in order to target high-risk patients for re-admission.[41] Systematic and careful assessment of this phenomenon in each hospital is essential to improve resource utilization. One suggested strategies is the introduction of an ICU outreach program in which ICU nurses and doctors assist in the post-ICU management until the

patient is no longer causing concern. Such approach has been shown to reduce hospital mortality from 12.8 to 7.8% in a recent study from UK hospital.[42] We are in the process of organizing such program in our hospital. We expect this program will not only reduce mortality but it will also reduce ICU resource utilization per patient. Another suggested strategy is to keep patients who are at a higher risk for re-admission for an extra 48 hours in the ICU.[43] It has to be seen which approach has a more positive impact on patients' outcome and resource utilization on whether the 2 approaches have cumulative effect.

The tools for monitoring resource utilization. The high cost of the ICU care and interventions makes a strong case for establishing a database of patients treated in each ICU; these database can be analyzed taking account of mix case and severity of illness to provide information on resource utilization in relation to outcome and also direct comparisons of outcome between units. Having a database in the ICU has become a fundamental part of the modern ICU practice in the Europe and North America (for example the Society of Critical Care Medicine Project Impact, Des Plaines, Illinois, United Sates of America). Following the development of prognostic scoring systems in the intensive care medicine in 1980s, there has been a substantial improvement in scoring models. They are now based on a larger database, and have been validated in many multicenter and international studies all over the world. Prognostic scoring systems may be used for assessment of severity of illness, evaluation and comparing outcome and survival (hospital mortality), quality assessment, cost-benefit analysis, and in clinical decision-making. The relationship of the observed hospital mortality rate to the estimated mortality provides the basis for clinical performance measurement. Since each ICU serves a different patient population, each scoring system must be calibrated in the individual hospital to ensure that the model is applicable. General scores covering more than one disease include Acute Physiology And Chronic Health Evaluation (APACHE) II,[44] APACHE III,[45] Simplified Acute Physiology Score II,[46] Mortality Probability Model II,[47] and Serial Sequential Organ Failure Assessment.[48] The KFNGH in Riyadh has pioneered the concept of ICU database development in KSA. The system started in 1997 has become fully developed and operational since 1999 to monitor all ICU admissions for the quality of care in the ICU and resource utilization using internationally recognized severity of illness scoring systems. These systems have been evaluated for their validity in general ICU patients[49] and in patients with special conditions such as liver transplant in our hospital[50] and other hospitals.[51,52]

The way forward. The Saudi hospitals have to explore better ways to manage our sickest patients, including improvements in triage, explicitly describing criteria for ICU admission and discharge, timely DNR decisions, efficient care, and expert decision support systems. Improving resource utilization of the ICU requires teamwork including not only the intensivists but also the hospital administrators and other health care personnel. Of special importance are the proper referrals and the appropriate utilization of DNR orders preventing unnecessary ICU admissions, thereby releasing valuable beds for use by patients in greater need. We should follow a serious and systematic approach to improve resource utilization and ensuring that admission to an ICU bed happens in a timely manner to ensure best outcome. Otherwise, not only the hospitals but also those patients who are likely to benefit from ICU care will have to pay the price.

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