

## Are intensive care units safe?

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Intensive care units (ICUs) are areas within a hospital that are designed to care for patients with grossly altered body physiology. Resources such as advanced equipment and staff with special skills are pooled in these areas in order to deliver optimal medical care commensurate with the serious nature of the illness. Intensive care should be provided on a 24-hour basis. In the early days of intensive care, emphasis was more on patient outcome rather than the mode of health care delivery. Survival of the patient was not taken for granted, nor was mortality viewed as a failure of medical management. The complexion of health care delivery has changed over the decades. With patients and their families viewing medical care as a *purchasable commodity*, administrators and health care providers have rightly shifted their focus to health care delivery processes in addition to the actual modalities of medical care. Patients have become *consumers* and health care personnel, the *providers* of this medical commodity. It is not enough if medical care is provided according to best evidence culled from literature. Such care needs to be delivered with absolute safety. Though this seems a tall ask considering the varied nature of medical illness, such is the demand of patients and their families in the present day. The argument that *one-plus-one is never always two* in the field of medicine does not seem to hold water any longer.

### Defining and measuring patient safety

Literature is replete with evidence that both the quality and the safety of care delivered in hospitals can be improved. It is estimated that between 44,000 and 98,000 people die each year from medical errors.<sup>1</sup>

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Patients in ICUs constitute a higher risk group as they are sicker and are subjected to more invasive interventions. It was estimated in one medical-surgical ICU that around 1.7 errors occur per patient per day.<sup>2</sup> Around 29% of these errors had a potential to cause significant harm or death. Given an average length of stay of 3 days in the ICU, this data suggests that nearly all patients who are admitted to an ICU will suffer a potentially life-threatening medical error at some time during their ICU stay. When this data is further extrapolated to cover all ICUs in the United States, it suggests that approximately 85,000 errors can occur every day (of which 24,650 can be potentially life-threatening). And this data applies to an advanced country. Though we have no data to highlight the enormity of the problem in Indian ICUs, we can be sure that safety is a factor that should be causing concern to patients, health care providers and administrators alike.

Medical errors can be of two types - *errors of commission* and *errors of omission*. Errors of commission occur as a result of things that we do actively to patients, while errors of omission happen because we fail to do something that has evidence in its favour. The figures mentioned earlier reflect acts of commission. Factoring in errors of omission would make the problem even larger.

The Agency for Health Care Research and Quality defines *patient safety* as 'the absence of the potential for, or the occurrence of health care-associated injury to patients created by avoiding medical errors as well as taking action to prevent errors from causing injury'. For this purpose, *medical errors* are defined as 'mistakes made in the process of care that result in, or have the potential to result in, harm to patients'. As mentioned earlier, these mistakes could

**How to cite this article:** Ramkumar V. Are intensive care units safe?. *Ind J Resp Care* 2013; 2:251-4.

be the result of either acts of commission or acts of omission. Medical errors can result in an injury (when it is called an *incident*) or may result in no harm (when it is called a *near miss*).

With increasing emphasis on the safe delivery of health care, intensivists must move from the art of practicing their profession to its science. Anyone who works in an ICU must first ask oneself this question, '*Am I doing what I should be doing?*' To get an honest insight into the functioning of our own ICUs, one needs to do a gap analysis between the care that is actually being delivered and the care that is considered ideal under the current circumstances. Once this visible gap is identified, one should examine how clinical and operational changes can be made within the framework of institutional finances to deliver *safe intensive care*.

### Developing a safety culture

In my opinion, medicine as practiced in India is still in between the traditional *art form* and the more talked about *scientific evidence-based form*. While science does have an answer to problems in most fields, art (intuition or experience or whatever-you-may-want-to-call-it) still plays a role in decision-making in health care. This *unscientific* approach that most doctors adopt could be the reason why medical errors creep in despite our best efforts.

In the high-risk and often stressful environment of an ICU, work slowly becomes repetitive and staff gradually become more *skilled* in routinely performed tasks. In such a setting, it is very easy for all concerned to lose sight of the hazardous nature of their job. A safety culture ensures that people never lose sight of the hazards involved in the course of their work through constant reminders in various forms.

Though the safety of ICUs can be determined in a prospective manner by performing a survey, one must remember two other less formal approaches to obtain this kind of information - *story telling* and *continued exercise of vigilance*. Story telling, or otherwise loosely called coffee-room discussion, is often a good platform for exchange of ideas. When incidents and near misses are brainstormed in an informal manner

amongst peers, workable solutions evolve which lead to feasible changes in practice. Shared experiences lead to increased professional vigilance, which by itself encourages people to tell more stories. Other academic activities such as institutional mortality and morbidity meetings, and departmental statistics meetings often provide pointers to the quality of health care being delivered. Proactive leaders who are committed to safety, along with staff members who not only understand that errors can occur but who are also willing to act on such errors to improve safe delivery of health care, can bring about a major change in ICU safety.

Solutions to problems can be implemented mandatorily from the *top* by the management. Such implementation has the necessary *push* to see it through to fruition. Needless to say, such implementation is often accompanied by a feeling of resentment from the ground-level workers. On the other hand, when the problem is identified and addressed by the staff themselves, implementation is likely to be more successful as the desire (or *pull*) for change is from the workers themselves. Leaders can ensure that a safety culture is born and nurtured in ICUs by encouraging workers to identify unsafe practices and speak freely about them. The best course of action to ensure patient safety should be suggested by the workers themselves so that they will have a sense of ownership of the idea. This will also ensure that the owners will create enough *pull* in the right direction to see their idea work. Leaders should only be the catalyst for change. All the ingredients for the change, including its recipe, should come from the workers themselves. Thus, ICU safety stems from a committed leadership, staff who acknowledge that error is inevitable, a non-punitive error-reporting system, and a willingness for continuously updating one's knowledge and skills to reduce errors due to inexperience.

### What are the common sources of medical errors?

A review of the common sources of medical error indicates that a large portion is *medication-related error*. Other causes for medical errors include *inexperience, lack of supervision, fatigue and lack of communication or miscommunication*.

### Medication-related errors

Medication-related errors rank very high amongst the causes of medical error. This can be attributed to the complex nature of the phases in medication use beginning with prescription, transcription, preparation, dispensing and administration. With new drugs being added to the formulary every day, it becomes unrealistic for health care professionals to have an in depth knowledge of all medications. While this is true in the context of drug usage in the general ward, the intensive care unit presents an even higher risk. Patients in ICUs usually receive many medications because of their critical illness. Their clinical condition often necessitates parenteral administration of most drugs, many of them involving complex calculations for initial bolus dosing followed by continuous infusion. To add to the complexity of the situation, ICU patients are often not in a position to detect and identify possible errors themselves because of disease-related or drug-induced altered sensorium. Errors can occur in the calculation of the rate of infused medications as most ICUs use an estimated weight or an admission weight (that may no longer be reliable after several days of ICU care) as the basis for drug calculations.

Medication-related errors were less common in ICUs that had a full-time intensivist directing medical management as compared to those that had anaesthesiologists supervising treatment on a part-time basis.<sup>3</sup> Wrong infusion rates contributed the most frequently observed medication error.

Several strategies have been identified to minimise medication-related errors in the high-risk ICU population. These include intensivist staffing, multidisciplinary rounding, standardisation of preparation of drugs for infusion, computerisation of physician order entry, use of bar code technology and use of computerised infusion devices.

It is no rocket science that ICUs directed full-time by qualified intensivists have higher levels of safety as they are managed by personnel who possess in-depth knowledge of intensive care. Mortality rates are decreased by nearly 40% in ICUs that are staffed by intensivists. However, as intensivists come

at a price, such luxury is not available even in the majority of ICUs in the United States.

Due to its complex nature, intensive care is best delivered when the service is provided by a multidisciplinary team consisting of a physician, nurse, respiratory therapist and pharmacist. The ICU is one of many locations where division of responsibilities multiplies the chances of successful outcome. However, one must remember that good communication bonds team members together and brings out the best in them. On the contrary, even the most talented multidisciplinary team can function chaotically if they fail to communicate with each other.

In the context of medication-related errors, inclusion of a pharmacist in the team is extremely beneficial. Computerised entry of physician orders takes care of errors introduced in prescription and transcription of drug orders. Bar-code technology has been used to ensure that the right drug in the right dose is given by the right route to the right patient at the right time. Computerised intravenous infusion devices facilitate the safe administration of potent drugs in the ICU.

### Training and learning in the intensive care unit

Despite all innovations in education technology, bedside learning is still an invaluable component that fine tunes the overall learning experience. There are several challenges in patient safety education in the ICU. Seven broad categories of conditions that exist in an ICU promote medical errors. These include high workload; inadequate knowledge, ability or experience; poor interface design; inadequate supervision or instruction; stressful environment; mental state (fatigue or boredom) and change.<sup>4</sup> Trainees entering ICU rotation face most of these error-promoting conditions.

Residents, like nurses, constitute an important group of individuals who can positively enhance patient safety as they are present on a 24-hour basis in the ICUs. Training of residents has always concentrated on teaching cognitive and technical skills. Trainees should be good communicators and effective team players. They should have an open

mind to recognise and respond to errors in an honest manner that is educative to all concerned. They should be supportive to other team members and be analytical when a medical error occurs. Directors of intensive care units should be available round-the-clock to supervise the care being provided by trainees. Residents should be encouraged to consult senior staff in all clinical decisions irrespective of the time of the day. It should be made clear to residents that calling for assistance is NOT a sign of weakness.

### Monitoring patient safety

Patient outcome in terms of mortality and morbidity is much easier to monitor than the safety with which medical care is delivered in a hospital. Donabedian's three-step model for monitoring quality of medical care can be used as a framework for monitoring safety as well.<sup>5</sup> In this model, *structure* (how care is organised) plus *process* (what we do) influences patient *outcomes* (the results achieved). This model was adapted to patient safety by adding a fourth element, *culture* (which includes the collective attitudes and beliefs of caregivers).

An institution that is committed to improving patient safety will try to find an answer to the question 'How often do we harm patients?' Administrators and staff will look at incidents as *learning experiences* and see how best such incidents can be prevented in the future. An open system of reporting that is non-punitive will encourage honest reporting. Once reporting of medical errors becomes routine, administrators as well as staff will realise that though the incident was unfortunate, an in-depth analysis of the error will move patient safety up by several notches.

One other issue of importance in teaching departments is that residents may have been involved when the adverse event happened but would have rotated off-service before the completion of a root cause analysis. Thus, they would have missed out on the complete cycle of quality improvement and risk management. Such a situation can be corrected by

including such issues in the agenda for departmental meetings or discussing the incidents in teaching programmes where all residents would benefit from the exercise.

Suggestions that come out of a root cause analysis should be discussed and implemented, if required in several phases. Efforts to improve safety should not be superficial. Classically, what is often offered as a solution is *an inch deep and a mile wide* whereas what is needed should be *an inch wide and a mile deep*. The deeper the plough runs, the better is the land tilled; what results is a better crop.

Finally, it is needless to say that it is people, not data, that improve patient care. Safety is as important as the quality of health care. The question that should take priority is not whether the peak has been scaled, but whether the path taken to reach the pinnacle was safe. An intensive care unit needs a safety culture that has its roots in a committed leadership, the acceptance that error is inevitable, a non-punitive reporting system and staff that is committed to continuous update of knowledge and psychomotor skills. Though it may be difficult to achieve zero error in medical care, it certainly deserves our best efforts to do so.

### References

1. Kohn L, Corrigan J, Donaldson M, editors. To err is human: Building a safer health system. Washington, DC. National Academy Press; 1999.
2. Vincent C, Taylor-Adams S, Stanhope N. Framework for analysing risk and safety in clinical medicine. *BMJ* 1998;**316**:1154-7.
3. Van den Bent PM, Fijn R, Van der Voort PH, Gossen AA, Egberts TC, Brouwers JR. Frequency and determinants of drug administration errors in the intensive care unit. *Crit Care Med* 2002;**30**:846-50.
4. Reason J. Understanding adverse events: Human factors. *Qual Health Care* 1995;**4**:80-9.
5. Donabedian A. Evaluating the quality of medical care. *Milbank Mem Fund Q* 1966;**44**:166-206.