



Learning from the non-survivors

Santhana Kannan

ABSTRACT

Department of Anaesthesia, City Hospital, Birmingham, United Kingdom.

Correspondence:

Dr Santhana Kannan,
Department of Anaesthesia,
City Hospital, Dudley Road,
Birmingham B18 7QE, United
Kingdom; Phone: 0121 5074343;
Fax: 0121 5074349; Email:
s.kannan@nhs.net

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Intensive care unit has a high mortality rate where despite best of the efforts by the healthcare staff, some patients will not survive. Autopsy studies have shown that missed diagnosis is not an infrequent occurrence. However, the rates of hospital autopsies are variable. 'Digital autopsy' is a recent modality, which can reduce the need for open autopsies, besides providing useful information about the cause of death instantaneously. Resource constraints mean that it is not universally applicable at present. Apart from correct diagnosis, the 'process of care' is also vital to successful outcome. 'Mortality review' or audit of all deaths in intensive care should look at this aspect, which in turn will help identify areas for individual, team and system improvements.

Key words: – Mortality; Hospital mortality, Cause of death; Intensive care; Diagnostic techniques and procedures; autopsy; Investigative techniques

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Intensive Care Unit (ICU) is an area with a mortality rate of around 15 – 18 %.^{1,2} Increasing life expectancy and medical advancements also bring in expectations from patients and their relatives that 'almost all conditions can be cured'. While deaths due to cancer and major surgery (e.g. transplant and cardiac procedures) are more acceptable to the public, the same due to non-malignant conditions (e.g. pneumonia, septic shock, pancreatitis) are likely to be considered to be a result of some deficiencies in the care.

It is easy to forget the non-survivors and accept their outcome as an inevitable consequence of their illness. However, the non-survivors help us in a variety of ways although individually they could not benefit. Some of them become organ donors and anonymously contribute to the well-being and/or survivability of other individuals. Many have been part of clinical trials which underpin current clinical guidelines. Let us take the example of a trial where the 'intervention arm' had definite life-saving potential. Imagine the patients who were in the 'control arm' and who would have otherwise potentially survived had they been in the 'intervention arm'. Alternatively, if the 'intervention arm' had worse results, some patients would have lost their lives just because of being in

that arm.

In a fair proportion of patients, the cause of death is not always discernible, may it be due to lack of enough time for investigations, inability to investigate adequately due to clinical instability, equivocal results of investigations or having a combination of conditions which preclude identifying the precise cause. One potentially useful learning tool in such patients have been 'autopsy' or 'post-mortem examination'. The advent of advanced investigation modalities such as MRI, CT, VQ scan, PET scan, immunoassays etc. may have improved our diagnostic ability, thereby reducing the need for autopsy. Despite the above, in a significant number of cases, the autopsy diagnosis is different from clinical one. Roosen et al. found a class 1 error (pre-mortem detection has potential for therapeutic change with possible altered outcome) in 16% of the 100 ICU patients who underwent autopsy.³ In a recent post-mortem analysis involving more than 1000 patients who died in ICU for reasons other than a neoplastic disease, a solid or hematologic cancer was found in 7% of cases. More than half of these missed diagnoses were classified as a major discrepancy including those with chronic illnesses.⁴ Khan et al. found that there was poor agreement between the clinical and autopsy diagnosis, especially in

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pulmonary embolism and liver cirrhosis, while there was moderate agreement among cases of myocardial infarction.⁵ The rate of hospital autopsy averaged 60% in 'Commonwealth of Independent States' to 12.4% in European Union countries in 2015.⁶ However, the rates in individual countries varied from < 1% to 78%. In many countries, autopsies are now restricted, where there is a legal requirement of obtaining next of kin's consent for this examination, which is often refused on religious or social grounds. The thought of the patient being 'opened-up' after death can be distressing to many relatives. As it is not going to offer any benefit to that patient, it is understandable if a request for autopsy is declined.

Post-mortem scanning also termed as 'digital autopsy' / 'virtual autopsy' / 'virtopsy' is a new modality which was first introduced in forensic field.⁷⁻⁹ It has subsequently been introduced in standard clinical settings too. The technique is non-invasive and can be completed quickly. It involves techniques such as 3D reconstructive CT and MRI scans as also photogrammetry.¹⁰ It can be supplemented with angiography etc. which are much less invasive than open autopsy. In a large study involving 182 patients, whole body CT and MRI followed by full autopsy was done to investigate the cause of death. It was concluded that autopsy was not needed in 48% of patients.¹¹

Digital autopsy has its limitations. The scans do not have the resolution to detect focal/microscopic injury, vascular remodelling and some forms of brain injury. Nevertheless, it has tremendous potential as a learning tool. An important barrier to the use of digital autopsy is resource allocation. Even in some economically advanced countries, currently, the responsibility of paying for digital autopsy falls on the family of the deceased. This option is useful for relatives of patients who would otherwise require open autopsy in legal circumstances.

An important contribution to patient outcome comes from the 'process of care'. We know that a timely investigation in some patients can dictate the intervention and improve the chances of successful intervention (e.g. CT scan which identifies an extradural hematoma). Similarly, timely administration of antibiotics in septic shock or removal of an infected central venous catheter can save lives.¹² Regular review by senior medical personnel is required to ensure that the treatment response has

been assessed optimally. It is important to confirm that the 'process' was followed satisfactorily, especially in non-survivors. This is only possible with review of every patient's care from admission to death.

Many centres have systems to discuss 'unusual' or 'complex' patient presentations in their morbidity & mortality meetings. While it is useful to discuss these, it is equally important to look at other patients who would be considered 'standard presentations' such as pneumonia, myocardial infarction or stroke. Recently, there has been a considerable emphasis on looking at *all* hospital deaths in the United Kingdom to review the process of care. In the vast majority of patients, no significant deficiencies or 'missed opportunities' in care would be identified. However, audits of such reviews have identified several areas which have a potential to be improved, including documentation, timely communication with relatives, continuity of care, lack of appropriate escalation etc.¹³ What these reviews must not be is an excuse to apportion blame. The intention must be to improve the system and mechanics rather than to find a culprit.

As a mortality reviewer, the author has been able to identify many of the issues mentioned above and to suggest steps to plug those gaps in care. These include discussions in team meetings, feedback to the relevant clinical teams and individuals, conducting educational sessions on atypical presentations, formulating and modifying clinical guidelines and protocols, and addressing resource issues. None of the initiatives would be successful without the joint effort and a teamwork. The experience also helped improve personal clinical practice including improved documentation and pro-active communication.

Every intensive care unit must have a system of 'mortality reviews' of all non-survivors. The task needs to be shared between all senior clinicians where somebody not involved in clinical care of that patient does the review. There might be some challenges, such as access to medical records and time allocation. There needs to be an individual who oversees the whole review process. However, none of these factors are insurmountable. In the long run, mortality reviews will help us reflect on our team and individual performance as also improve the clinical pathways to the benefit of everyone. In future a more extensive use of the 'digital autopsy' will vastly aid its utility.

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