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# Why Process Quality Measures may be More Valuable than Outcome Measures in Critical Care Patients

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## Abstract

### Background

ICU is an ideal target for quality of care evaluation and initiatives because of the associated morbidity, mortality and high resource utilization of the patient population. Quality measures can be separated into structure, process and outcome. There has been longstanding debate about the ideal quality measure.

### Findings

Structure measures are typically most valuable when good quality of care is unlikely, as it will often help illustrate glaring deficiencies. Process measures attempt to assess healthcare provider's compliance with practices that are associated with positive outcomes. Outcome quality measures assess whether healthcare goals were realized. These measures can range from mortality, cost of care and patient satisfaction. The advantage of process measures is that data can be collected relatively quickly. Outcome measures can be rare or difficult to track; this can make the data collection process difficult. Also a larger sample size may be necessary to capture the outcome measure. Process measures frequently do not require large sample sizes and therefore allow for a quicker feedback process. Process measures also reduce the need for adjusting for severity of illness and co-morbidities, which can be time consuming and labor intensive.

### Conclusion

It is apparent that process quality measures are the most practical, impactful and logical option for critical care patients. Outcome measures do have value but can be difficult to interpret in the critical care setting due to the heterogeneity of patients, the multiple disciplines involved in care and measures can be subjective.

**Keywords:** Critical care; Quality measurement; Healthcare quality improvement; Quality improvement; Quality improvement methodologies

## Introduction

Quality improvement has become an integral part of today's health care system. Such initiatives allow for improved safety, patient focused care, effectiveness and efficiency. This is paramount in an aging population where our resources may be limiting and demands may be increasing. Institutions such as the Canadian Patient Safety Institute have assisted in improving patient safety awareness and have initiated programs such as "Safer Healthcare Now" to ensure healthcare organizations are meeting key standards [1]. Critical care medicine is a key area for quality improvement initiatives because of the severity of illness, aggressive level of care and the high resource utilization. It is estimated that 1% of GDP is directed towards critical care costs [2]. Up to 20% of hospital budgets are related to ICU patients [3]. It is also a venue where morbidity and mortality are high; mortality rates are estimated at 20% for most critical care units [4]. High morbidity is seen because of the aggressive measures required to support critically ill patients [5]. Because of the associated morbidity, mortality and high resource utilization, ICU is an ideal target for quality of care evaluation and initiatives. Quality measures can be separated into structure, process and outcome [6]. This paper will evaluate why process quality measures may be more relevant than outcome measures for critical care patients.

## Discussion

### Structure, process and outcome measures

Quality measures can be divided in three categories: structure, process and outcome [7]. Structure measures how care is delivered, the capabilities and qualifications of their professionals and staff, and the environment in which health care is delivered. An example of this would be the percentage of board-certified intensivists or nurses. Structure measures are typically most valuable when good quality of care is unlikely, as it will often help illustrate glaring deficiencies. Process measures attempt to assess healthcare provider's compliance

with practices that are associated with positive outcomes. An example of this would be percentage of myocardial infarction patients that are sent home with a beta-blocker, which are associated with decreased mortality. Lastly, outcome quality measures assess whether healthcare goals were realized. These measures can range from mortality, cost of care and patient satisfaction [6].

### Characteristics of quality measures

It is important for quality measures to be practical. The RUMBA rules of quality measures help achieve this [8].

- Relevant to the problem/concern: Will the quality measure actually reflect an increase/decrease in quality?
- Understandable: Will the stakeholders be able to interpret the data collected?
- Measurable. Is there an ability to quantify quality in the area of concern?
- Behaviourable: Can the quality measure be altered by a change in attitudes and conduct?
- Achievable: What are the likelihood goals will be met? [9]

The RUMBA rules will be important in the evaluation of process versus outcome measures. As we will see many outcome measures do not fulfill these rules.

## Outcome Measures

Outcome measures are often practical and can be easy to measure. They are often sought out from policymakers and the public because of these reasons. Outcome measurement will also reflect all features of care and not simply those that are measurable [10].The following section will review typical critical care outcome measures and their advantages and disadvantages.

Mortality is a commonly used outcome measure in healthcare. It is easily measured and can reflect overall care. One of the major concerns with mortality evaluation in the critical care setting is the heterogeneity of the patient population. Critical care patients often have a multitude of co-morbidities and will present with varying severity of illness. For example if an ICU were located at a cancer center, one would expect sicker patients and therefore higher morbidity and mortality. Quality of care provided may be exceptional but if one were to compare with another ICU with less sick patients, this would not be apparent. To compensate for this, one would have to adjust for severity of illness, which can be more labour-intensive and will require more resources. As a result of risk adjustment, a larger sample size is usually necessary to be able to compare ICU sites [11]. Another issue complicating mortality comparisons is that patients will have a variety of diagnoses. Unlike cardiology in which patients typically have only a few diagnoses such as myocardial infarction or heart failure critical care patients have of a multitude of diagnoses ranging from septic shock, pneumonia, renal failure, liver failure, stroke or cardiac dysfunction often in combination. Therefore comparing ICUs may not be appropriate if they are not servicing the same type of patients.

Another concern regarding mortality is that many ICU patients may be evaluated and managed at different points of their illness. For example, some patients are admitted directly from the emergency room and others have been extensively managed on the ward. Therefore, most of their management and treatment decisions have been established prior to entering the intensive care unit. For instance, if a patient was receiving prolonged antibiotics and develops *C. difficile* and expires in the intensive care unit, mortality is increased despite most of the patient's management having occurred on the ward.

As a result of multiple co-morbidities, critical care patients often require multiple medical disciplines for their care. For example, an ICU patient that suffers a subarachnoid hemorrhage could involve neurosurgery, neurology, hematology and interventional radiology. Patient outcomes, including mortality, can be influenced by any of these disciplines despite the management of the critical care team. Mortality may reflect the overall care of the patient but may not represent the quality of care provided by the critical care team.

Finally and most notably, there can be a disincentive to provide a palliative approach when mortality is used as an outcome measure. Many ICU patients have end-stage/terminal diseases and decisions are often made to provide palliative care rather than prolonging pain and suffering [12]. Physicians adopting a palliative management risk being evaluated poorly by having increased mortality rates. One might argue that physicians may even choose to continue care inpatients with poor prognoses in order to improve their mortality rates. This would have the potential to increase resource utilization and simultaneously decrease quality of care.

Other examples of intensive care outcome quality measures are Central Line-Associated Primary Blood Stream Infection (CLI) and ventilator associated pneumonias (VAP). CLI and VAP are associated with increased length of stay, increase costs and increase morbidity for ICU patients [13]. Many health organizations have included these measures for public reporting at a hospital, health authority and provincial level [14].The concern with such measures is that there is a strong element of subjectivity or bias. Introduction of such bias can make the data difficult to interpret. Severity of illness can also influence the risk of acquiring CLI or VAP. Sicker patients will be more prone to acquire nosocomial infections.

As mentioned previously, critical care has high associated costs. This will be of growing concern as the population ages. As a result, cost is becoming an important outcome measure when evaluating critical patients. Being fiscally responsible and optimizing efficiency is an integral part of quality management. The issue regarding costs is consistency. There are several ways to measure costs and they often come from different perspectives. For example, many studies use cost minimization, cost-effective analysis, cost-benefit analysis or cost utility analysis. Each of these types of measures has its advantage and disadvantages and may be more applicable in specific healthcare settings. Also, cost will depend on the perspective taken. For example, societal versus health authority versus hospital perspectives will have varying costs for the same intervention [15,16].

## Process Measures

Process quality measures often look at compliance with evidence-based practices that have shown to improve outcomes. The following are process measures often seen in the critical care setting:

- Use of lung protective strategy for ARDS.
- Daily awakenings and spontaneous breathing trials.
- Early initiation of antibiotics.
- Hand hygiene.
- Early administration of enteral nutrition.
- Full-bodied draping to prevent CLI.

The advantage of process measures is that data can be collected relatively quickly. Outcome measures can be rare or difficult to track, this can make the data collection process difficult. Also a larger sample size may be necessary to capture the outcome measure. Process measures frequently do not require large sample sizes and therefore allow for a quicker feedback process [11]. When we look at quality improvement efforts, the PDCA-cycle (plan, do, check, act) is a valuable approach to achieve one's goals [12]. Having the ability of using smaller sample sizes and providing quicker feedback permits for more PDCA-cycles, this will enhance quality development. The other factor that contributes to quicker and more effective feedback is that the clinician can identify a single error of commission or omission that can be improved upon. This differs from outcome measures such as mortality because several factors could have contributed to the result. Process measures also reduce the need for adjusting for severity of illness and co-morbidities, which can be time consuming and labor intensive [11]. Because of the heterogeneity of critical care patients, this makes for a more practical approach.

## Conclusion

It is apparent that process quality measures are the most practical, impactful and logical option for critical care patients. Process quality measures track compliance with evidence based procedures that have a clear impact on outcomes. Data can be collected relatively quickly and do not require large sample sizes. This allows for reduced costs, manpower, and thus allows for quicker feedback and system change. Outcome measures do have value but can be difficult to interpret in the critical care setting due to the heterogeneity of patients, the multiple disciplines involved in care and measures can be subjective.

Any individual or group attempting quality improvement in an intensive care setting should be aware of the pros and cons of structure, process, and outcome measures. With regards to cost, time, ease, and other resources we feel process measures are superior to other quality measures such as structure and outcome measures.

## Competing Interests

The authors declare that they have no competing interests.

## Authors' Contributions

Author KK contributed the most to this paper and GD provided mainly review and revisions and we have no conflicts of interest to disclose. Ethics approval was not sought given the review nature of this paper.

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